

Applicant: Stefan SCHUERG et al.  
Docket No. R.306615  
Preliminary Amdt.

**AMENDMENTS TO THE SPECIFICATION:**

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/001994 filed on September 6, 2004.

[0000.6] BACKGROUND OF THE INVENTION

[0000.8] Field of the Invention

Please replace paragraph [0001] with the following amended paragraph:

[0001] The invention relates to a valve for a fuel injection system of an internal combustion engine[[],] having the characteristics recited in the preamble to claim 1, specifically and in particular for an injector of a common rail injection system.

Please replace paragraph [0002] with the following amended paragraph:

[0002] Description of the Prior Art

Please replace paragraph [0003] with the following amended paragraph:

[0003] Common rail injection systems have a plurality of injectors, which are supplied with fuel from a central high-pressure reservoir, known as a common rail, by a high-pressure pump under the control of an electronic engine controller, and which inject the fuel via a valve into the combustion chambers of the cylinders of the internal combustion engine. Once such valve is known, from among other sources German Patent Disclosure DE 199 40 296 A1 of the present Applicant and, depending on the valve position, serves to connect a high-pressure region of an injector of the injection system with a low-pressure region, or to disconnect

them, when fuel is injected through the valve into the combustion chamber of a cylinder and when the delivery of fuel is to be interrupted, respectively.

Page 2, please replace paragraph [0006] with the following amended paragraph:

[0006] Advantages of the Invention

**SUMMARY AND ADVANTAGES OF THE INVENTION**

Please replace paragraph [0007] with the following amended paragraph:

[0007] By comparison, with the use of the valve of the invention, ~~having the characteristics recited in claim 1~~, cavitation damage can be prevented with good success, since the fuel stream downstream of the valve seat is not deflected only simply in the axial direction. Instead, on passing through [[the]] ~~a~~ hollow throat, it is imparted a speed component in a direction that points away from the center axis of the valve member, so that after emerging from the hollow throat, it strikes a diametrically opposed region of an inner wall of an outflow bore of the valve housing. On impact, some of the fuel stream is directed along the inner wall back in the direction of the valve gap, and as a result, immediately downstream of this gap, an eddy forms in the widened annular chamber between the hollow throat and the diametrically opposite wall region of the inner wall. As a result of this eddy, on the one hand additional fuel is introduced into the annular chamber downstream of the valve gap, so that more fuel is present there, which counteracts cavitation phenomena in the vicinity of the valve gap and as a result counteracts cavitation damage at the valve seat that is caused over the long term. On the other hand, the fuel directed back in the direction of the valve gap flows along the inner wall of the valve housing, so that additional fuel is introduced precisely

Applicant: Stefan SCHUERG et al.  
Docket No. R.306615  
Preliminary Amdt.

into this region that is especially threatened with cavitation, and local vapor bubble formation as a consequence of a fuel pressure drop can be avoided.

Page 3, please replace paragraph [0010] with the following amended paragraph:

[0010] While the outer circumferential surface portion, adjoining the edge on the side toward the cross-sectional thickening, is preferably oriented essentially parallel to a center axis of the valve member, the circumferential surface portion adjoining the edge on the side toward the hollow throat is preferably inclined counter to the flow direction at an angle of between 20° and 80°, preferably between 30° and 60°, to the center axis of the valve member, so that the two circumferential surface portions meet one another at an angle of between 200° and 260°, and preferably between [[190]] 200° and 240°.

Page 5, please replace paragraph [0014] with the following amended paragraph:

[0014] Drawing **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0015] with the following amended paragraph:

[0015] The invention will be described in further detail below in terms of an exemplary embodiment, in conjunction with the associated drawings, in which [[.]] Shown are:

Please replace paragraph [0016] with the following amended paragraph:

[0016] Fig. 1[[, a]] is a fragmentary side view of a valve member or valve bolt of a valve of the invention;

Applicant: Stefan SCHUERG et al.  
Docket No. R.306615  
Preliminary Amdt.

Please replace paragraph [0018] with the following amended paragraph:

[0018] Fig. 3, an enlarged detail of Fig. 2, but with a different geometry of the valve member downstream of the valve gap in terms of the flow direction; and

Please replace paragraph [0020] with the following amended paragraph:

[0020] ~~Description of the Exemplary Embodiments~~

#### **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Page 6, please replace paragraph [0022] with the following amended paragraph:

[0022] The complete structure of such an injector is described at length, for example in German Patent Disclosure DE 196 19 523 A1 ~~of the present Applicant~~; while further details of the structure of its valve can be found in the aforementioned DE 199 40 296 A1 ~~of the present Applicant~~; further explanation is therefore dispensed with at this point, and for such explanation, see these references.

Please replace paragraph [0023] with the following amended paragraph:

[0023] The valve 2 substantially comprises a valve housing 4, into which a rotationally symmetrical valve bolt 6 (see Fig. 1) is inserted axially movably. The valve bolt 6 has a conical sealing face 8, which tapers in the flow direction and which when the valve 2 is closed rests sealingly against a complementary conical valve seat 10 of the housing 4. As best shown in Figs. 2 through 4, when the valve 2 is open the sealing face 8 together with the valve seat 10 ~~defines~~ define a valve gap 12, surrounding the valve bolt 6, in the form of an annular flow conduit, through which the fuel to be injected flows from the high-pressure side 14 of the valve 2 to its low-pressure side 16.

Applicant: Stefan SCHUERG et al.  
Docket No. R.306615  
Preliminary Amdt.

Page 9, please replace paragraph [0028] with the following amended paragraph:

[0028] While Fig. 2 shows a valve bolt in which the circumferential surface portion 36, adjoining the edge 34 inside the hollow throat 18, is oriented at an angle of inclination  $\alpha$  of approximately  $60^\circ$  to the center axis 22 of the valve bolt 6, and the fuel therefore strikes the inner wall 24 of the outflow bore 26 rather steeply, and thus a relatively large amount of fuel is directed back in the direction of the valve gap [[28]] **12**, Figs. 3 and 4 show two valve bolts 6 in which this angle of inclination  $\alpha$  is approximately  $35^\circ$  and approximately  $20^\circ$ , respectively, and correspondingly less fuel is therefore directed back in the direction of the valve gap [[28]] **12**, forming an eddy 34.

Page 10, please add the following new paragraph after paragraph [0031]:

[0032] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.